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ABSTRACT

Focusing on factory production occupations, this document is one in a series of forty-one reprints from the Occupational Outlook Handbook providing current information and employment projections for individual occupations and industries through 1985. The specific occupations covered in this document include assemblers, blue collar worker supervisors, boilermaking occupations, boiler tenders, electroplaters, industrial machinery repairers, inspectors (manufacturing), maintenance electricians, millwrights, power truck operators, production painters, stationary engineers, and wastewater treament plant operators. The following information is presented for each occupation or occupational area: a code number referenced to the Dictionary of Occupational Titles; a description of the nature of the work; places of employment; training, other qualifications, and advancement; employment outlook; earnings and working conditions; and sources of additional information. In addition to the forty-one reprints covering individual occupations or occupational areas (CE 017 757-797), a companion document (CE 017 756) presents employment projections for the total labor market and discusses the relationship between job prospects and education. (BM)

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ED158109

Factory Production Occupations

Reprinted from the
Occupational Outlook Handbook,
1978-79 Edition.

U.S. Department of Labor
Bureau of Labor Statistics
1978

Bulletin 1955-4

Containing the midpoints of the legs of right triangle *RST*, whe
pt. (−5, 5), *S* is pt. (1, 1), and *T* is pt. (3, 4).

Containing the longer diagonal of a quadrilateral whose vertic
pts. (2, 2), (−2, −2), (1, −1), and (6, 4).

Show that the equations $y - 1 = \frac{1}{3}(x + 3)$ and $y - 4 = \frac{1}{3}(x$
are equivalent.

An equation of the line containing pts. (−2, 3) and (4, −1) c
written in the form $y - 3 = -\frac{1}{2}(x + 2)$ or in the
$y + 1 = -\frac{1}{2}(x - 4)$, depending upon which point you take
(x_1, y_1). Show that the two equations are equivalent.

Show that the equations are equivalent.

$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$ $\quad y - y_2 = \frac{y_1 - y_2}{x_1 - x_2}(x - x$

State the equation of a line through pt. (p, q) and parallel to
containing pts. (a, b) and (c, d). $(a \neq c)$.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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CE 017 759

ASSEMBLERS

Nature of the Work

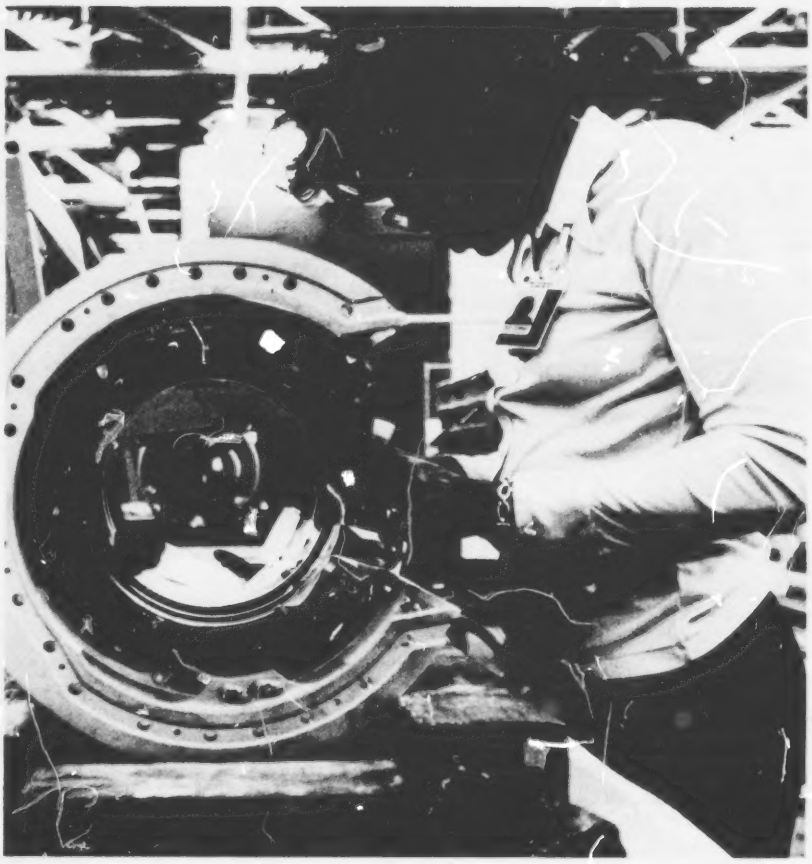
When Henry Ford began producing his automobile on an assembly line, modern mass production was born. Workers who before had built each automobile independently, now found themselves specializing in just one part of the job. Production became a team effort, with each worker performing a single task on every car rolling by on the line. Over the years, the assembly line spread to other industries, until today almost every manufactured item is produced in this way.

The workers who put together the parts of manufactured articles are called assemblers. Sometimes hundreds are needed to turn out a single finished product.

Many assemblers work on items that automatically move past their work stations on conveyors. In the automobile industry, for example, one assembler may start nuts on bolts by hand or with a hand tool, and the next worker down the line may tighten the nuts with a power wrench. These workers must complete their job within the time it takes the part or product to pass their work station.

Other assemblers, known as bench assemblers, do more delicate work. Some make subassemblies. These units are the intermediate steps in the production process; for example, steering columns for automobiles or motors for vacuum cleaners. Others make entire products. Assemblers in rifle manufacturing plants build complete rifles from a collection of parts and subassemblies and then test all the moving parts to be sure they function correctly. Bench work generally requires the ability to do precise and detailed work. Some electronics assemblers, for example, use tweezers, tiny cutters, and magnifying lenses to put together the small components used in radios and calculators.

Another group of assemblers, called floor assemblers, put together large machinery or heavy equipment on shop floors. School buses, cranes, and tanks are put together in this manner. Parts are installed and fastened, usually with bolts, screws, or rivets. Assemblers often use a power tool, such as a soldering iron or power drill, to get a proper fit.



Skilled assemblers work on complex subassemblies.

A small number of assemblers are skilled workers who work with little or no supervision on the more complex parts of subassemblies, and are responsible for the final assembly of complicated jobs. A skilled assembler may have to wire the tubes for a television set or put together and test a calculator. Some work with the engineers and technicians in the factory, assembling products that these people have just designed. To test new ideas and build models, these workers must know how to read blueprints and other engineering specifications, and use a variety of tools and precision measuring instruments.

Places of Employment

About 1,100,000 assemblers worked in manufacturing plants in 1976. Almost two-thirds were in plants that made machinery and motor vehicles. More than half of all assemblers were employed in the heavily industrialized States of California, New York, Michigan, Illinois, Ohio, and Pennsylvania.

Training, Other Qualifications, and Advancement

Inexperienced people can be trained to do assembly work in a few days or weeks. New workers may have their job duties explained to them by the supervisor and then be placed under the direction of experienced employees. When new workers have developed sufficient speed and skill, they are placed "on their own" and are responsible for the work they do.

Employers seek workers who can do routine work at a fast pace. A high school diploma usually is not required.

For some types of assembly jobs, applicants may have to meet special requirements. Some employers look for applicants with mechanical aptitude and prefer those who have taken vocational school courses such as machine shop. Good eyesight, with or without glasses, may be required for assemblers who work with small parts. In plants that make electrical and electronic products, which may contain many different colored wires, applicants often are tested for color blindness. Floor assemblers may have to lift and fit heavy objects, thus they should be physically fit.

As assemblers become more experienced they may progress to assembly jobs that require more skill and be given more responsibility. A few advance to skilled assembly jobs. Experienced assemblers who have learned many assembly operations and thus understand the construction of a product may become product repairers. These workers fix assembled articles that inspectors have ruled defective. Assemblers also may advance to inspector and a few are promoted to supervisor. Some assemblers become trainees in skilled trades jobs such as machinist.

Employment Outlook

Employment of assemblers is expected to grow faster than the average for all occupations through the mid-1980's, with thousands of openings each year. Most job openings, however, will result as workers retire, die, or leave the occupation.

More assemblers will be needed in manufacturing plants to produce goods for the Nations's growing economy. As population grows and personal income rises, the demand for consumer products, such as automobiles and household appliances, will increase. At the same time, business expansion will increase the demand for industrial machinery and equipment.

Most assemblers work in plants that produce durable goods, such as automobiles and aircraft, which are particularly sensitive to changes in business conditions and national defense needs. Therefore, even though employment is expected to grow, jobseekers may find opportunities scarce in some years.

Earnings and Working Conditions

Wage rates for assemblers ranged from about $3 to $7 an hour in 1976, according to information from a limited number of union contracts. Most assemblers covered by these contracts made between $4 and $6 an hour. Some assemblers are paid incentive or piecework rates, and therefore can earn more by working more rapidly.

The working conditions of assemblers differ, depending on the particular job performed. Bench assemblers who put together electronic equipment may work in a room that is clean, well lighted, and free from dust. Floor assemblers of industrial machinery may come in contact with oil and grease, and their working areas may be quite noisy from nearby machinery or tools that are used. Workers on assembly lines may be under pressure to keep up with the speed of the lines. Since most assemblers only perform a few steps in the assembly operation, assembly jobs tend to be more monotonous than other blue-collar jobs.

Work schedules of assemblers may vary at plants with more than one shift. Usually in order of seniority, workers can accept or reject a certain job on a given shift.

Many assemblers are members of labor unions. These include the International Association of Machinists and Aerospace Workers; the International Union of Electrical, Radio and Machine Workers; the International Union; United Automobile, Aerospace and Agricultural Implement Workers of America; the International Brotherhood of Electrical Workers; and United Steelworkers.

Source of Additional Information

Additional information about employment opportunities for assemblers may be available from local offices of the State employment service.

BLUE-COLLAR WORKER SUPERVISORS

Nature of the Work

In any organization, someone has to be boss. For the millions of workers who assemble television sets, service automobiles, lay bricks, unload ships, or perform any of thousands of other activities, a blue-collar worker supervisor is the boss. These supervisors direct the activities of other employees and frequently are responsible for seeing that millions of dollars worth of equipment and materials are used properly and efficiently. While blue-collar worker supervisors are most commonly known as foremen or forewomen, they also have many other titles. In the textile industry they are referred to as second hands; on ships they are known as boatswains; and in the construction industry they are often called overseers, straw bosses, or gang leaders.

Although titles may differ, the job of all blue-collar worker supervisors is similar. They tell other employees what jobs are to be done and make sure the jobs are done correctly. For example, loading supervisors at truck terminals assign workers to load trucks, and then check that the material is loaded correctly and that each truck is fully used. They may mark freight bills and keep charts to record the loads and weight of each truck. In some cases, supervisors also do the same work as other employees. This is especially true in the construction industry where, for example, bricklayer supervisors also lay brick.

Because they are responsible for the output of other workers, supervisors make work schedules and keep production and employee records. They use considerable judgment in planning and must allow for unforeseen problems such as absent workers and machine breakdowns. Teaching employees safe work habits and enforcing safety rules and regulations are other supervisory responsibilities. They also may demonstrate timesaving or laborsaving techniques to workers and train new employees.

Coordinating assignments is a responsibility of the blue-collar worker supervisor.

In addition to their other duties, blue-collar worker supervisors tell their subordinates about company plans and policies; reward good workers by making recommendations for wage increases, awards, or promotions; and deal with poor workers by issuing warnings or recommending that they be fired or laid off without pay for a day or more. In companies where employees belong to labor unions, supervisors may meet with union representatives to discuss work problems and grievances. They must know the provisions of labor-management contracts and run their operations according to these agreements.

Places of Employment

About 1,445,000 blue-collar worker supervisors were employed in 1976. Although they work for almost all businesses and government agencies, over half work in manufacturing, supervising the production of cars, washing machines, or any of thousands of other products. Most of the rest work in the construction industry, in wholesale and retail trade, and in public utilities. Because employment is distributed in much the same way as population, jobs are located in all cities and towns.

Training, Other Qualifications, and Advancement

When choosing supervisors, employers generally look for experience, skill, and leadership qualities. Employers place special emphasis on the ability to motivate employees, maintain high morale, command respect, and get along with people. Completion of high school often is the minimum educational requirement, and 1 or 2 years of college or technical school can be very helpful to workers who want to become supervisors.

Most supervisors rise through the ranks—that is, they are promoted from jobs where they operated a machine, or worked on an assembly line, or at a construction craft. This work experience gives them the advantage of knowing how jobs should be done and what problems may arise. It also provides them with insight into management policies and employee attitudes towards these policies. Supervisors are sometimes former union representatives who are familiar with grievance procedures and union contracts. To supplement this work experience, larger companies usually have training programs to help supervisors make management decisions. Smaller companies often use independent training organizations or written training materials.

Although few blue-collar worker supervisors are college graduates, a growing number of employers are hiring trainees with a college or technical school background. This practice is most prevalent in industries with highly technical production processes, such as the chemical, oil, and electronics industries. Employers generally prefer backgrounds in business administration, industrial relations, mathematics, engineering, or science. The trainees undergo on-the-job training until they are able to accept supervisory responsibilities.

Supervisors with outstanding ability, particularly those with college education, may move up to higher management positions. In manufacturing, for example, they may advance to jobs such as department head and plant manager. Some supervisors, particularly in the construction industry, use the experience and skills they gain to go into business for themselves.

Employment Outlook

Employment of blue-collar worker supervisors is expected to increase at about the same rate as the average for all occupations through the mid-1980's. In addition, many job openings will arise as experienced supervisors retire, die, or transfer to other occupations.

Population growth and rising incomes will stimulate demand for goods such as houses, air conditioners, TV sets, and cars. As a result, more blue-collar workers will be needed to produce and sell these items, and more supervisors will be needed to direct their activities. Although most of these supervisors will continue to work in manufacturing, a large part of the increase in jobs will be due to the expansion of nonmanufacturing industries, especially in the trade and service sectors.

There is usually keen competition for supervisory jobs. Competent workers who possess leadership ability and have a few years of collge are the most likely to be selected.

Earnings and Working Conditions

In 1976, average annual earnings of blue-collar worker supervisors who worked full time were $15,149, compared with $12,946 for workers in all occupations. Supervisors usually are salaried. Their salaries generally are determined by the wage rates of the highest paid workers they supervise. For example, some companies keep wages of supervisors about 10 to 30 percent higher than those of their subordinates. Some supervisors may receive overtime pay.

Since supervisors are responsible for the work of other employees, they generally work more than 40 hours a week and are expected to be on the job before other workers arrive and after they leave. They sometimes do paperwork at home, such as making work schedules or checking employee time cards, and may find themselves worrying about job-related problems after work.

Working conditions vary from industry to industry. In factories, supervisors may get dirty around machinery and materials and have to put up with noisy factory operations.

Some supervisors who have limited authority may feel isolated, neither a member of the work force nor an important part of management. On the other hand, supervisors have more challenging and prestigious jobs than most blue-collar workers.

Sources of Additional Information

A bibliography of career literature on management occupations is available from:

American Management Association, 135 West 50th St., New York, N.Y. 10020.

BOILERMAKING OCCUPATIONS

Nature of the Work

Boilers, vats, and other large vessels that hold liquids and gases are essential to many industries. Boilers, for example, supply the steam that drives the huge turbines in electric utility plants and ships. Tanks and vats are used to process and store chemicals, oil, beer, and hundreds of other products. Layout workers and fitters help make the parts for these vessels, and boilermakers assemble them.

Layout workers (D.O.T. 809.381 and .781) follow blueprints in marking off lines on metal plates and tubes. These lines serve as guides to other workers in the shop who cut the metal and then shape it on lathes or use other shaping tools such as grinders to produce the finished pieces. Layout workers use compasses, scales, gauges, and other devices to make measurements. Their measurements must be precise because errors may be difficult or impossible to correct once the metal is cut.

Before the boiler parts are assembled, *fitters* (D.O.T. 819.781) see that they fit together properly. These workers use bolts or temporary welds, called tackwelds, to hold the parts in place while they check the parts to see that they line up according to blueprints. Where alterations are necessary, fitters use grinders or cutting torches to remove excess metal, and welding machines to fill in small gaps. If large gaps appear, a new piece may have to be cut. Also, fitters use drills to line up rivet holes.

Small boilers may be assembled at the plant where they are made; however, once the pieces for a larger boiler or tank have been cut out and checked for a proper fit, they are transported to the shop or construction site where they are to be used. There, *boilermakers* (D.O.T. 805.281) assemble and erect the vessels using rigging equipment such as hoists and jacks to lift heavy metal parts into place, and then weld or rivet the parts together. After a boiler is completed, they test it for leaks or other defects.

Construction boilermakers also install auxiliary equipment on boilers and other vessels. For example, they install vapor barriers on open-top oil, gas, and chemical storage tanks to prevent fumes from polluting in the air. Boilermakers also install air pollution control equipment, such as precipitators and smoke scrubbers, in electric plants that burn high sulfur coal.

Boilermakers also do repair jobs. For example, boilers occasionally develop leaks. When they do, boilermakers find the cause of the problem, and then they may dismantle the boiler, patch weak spots with metal stock, replace defective sections with new parts, or strengthen joints. Installation and repair work usually must meet State and local safety standards.

Places of Employment

About 34,000 boilermakers, layout workers, and fitters were employed in 1976. Of these, several thousand boilermakers worked in the construction industry, mainly to assemble and erect boilers and other pressure vessels. Boilermakers also were employed in the maintenance and repair departments of iron and steel plants, petroleum refineries, railroads, shipyards, and electric powerplants. Large numbers worked in Federal Government installations, principally in Navy shipyards and Federal powerplants. Layout workers and fitters worked mainly in plants that make fire-tube and water-tube boilers, heat exchangers, heavy tanks, and similar products.

Boilermaking workers are employed throughout the country, but employment is concentrated in highly industrialized areas, such as New York, Philadelphia, Chicago, Pittsburgh, Houston, San Francisco, and Los Angeles.

Training, Other Qualifications, and Advancement

Many people have become boilermakers by working for several years as helpers to experienced boilermakers, but most training authorities agree that a formal apprenticeship is the best way to learn this trade. Apprenticeship programs usually consist of 4 years of on-the-job training, supplemented by about 150 hours of classroom instruction each year in subjects such as blueprint reading, shop mathematics, and welding. Apprentices often have to travel from one area to another, since there is not always work available in their locality.

Most layout workers and fitters are hired as helpers and learn the craft by working with experienced employees. It generally takes at least 2 years to become a highly skilled layout worker or fitter.

When hiring apprentices or helpers, employers prefer high school or vocational school graduates. Courses in shop, mathematics, blueprint reading, welding, and machine metalworking provide a useful background for all boilermaking jobs. Most firms require applicants to pass a physical examination because good health and the capacity to do heavy work are necessary in these jobs. Mechanical aptitude and the manual dexterity needed to handle tools also are important qualifications.

Layout workers and fitters may become boilermakers or advance to shop supervisors. Boilermakers may become supervisors for boiler installation contractors; a few may go into business for themselves.

Employment Outlook

Employment in boilermaking occupations is expected to increase much faster than the average for all occupations through the mid–1980's. In addition to the job openings resulting from employment growth, other openings will arise each year as experienced workers retire, die, or transfer to other fields of work.

The construction of many new electric powerplants, especially nuclear plants, will create a need for additional boilers and will cause employment of boilermakers, layout workers, and fitters to increase.

The expansion of other industries that use boiler products, such as the chemical, petroleum, steel, and shipbuilding industries, will further increase the demand for these workers. Also, as more laws are enacted to provide cleaner air, more boilermakers will be needed to install pollution control equipment.

Despite the expected overall increase in employment, most of the industries that purchase boilers are sensitive to economic conditions. Therefore, during economic downturns some boilermakers, fitters, and layout workers may be laid off, and others may have to move from one area of the country to another to find employment.

Earnings and Working Conditions

According to a national survey of workers in the construction industry, union wage rates for boilermakers averaged $10.03 an hour in 1976, compared with $9.47 for all building trades. Boilermakers employed in railroad shops averaged about $7 an hour in 1976.

Comparable wage data were not available for boilermakers employed in industrial plants. However, wage rates were available from union contracts that cover many boilermakers, layout workers, and fitters employed in fabricated plate work and the petroleum and shipbuilding industries in 1976. Most of these contracts called for hourly rates ranging from about $5.50 to $10. Generally, layout workers earned more than boilermakers, and boilermakers earned more than fitters.

When assembling boilers or making repairs, boilermakers often work in cramped quarters and sometimes at great heights, since large boilers may be over 10 stories tall. Some work also must be done in damp, poorly ventilated places. Thus boilermaking is more hazardous than many other metalworking occupations. Employers and unions attempt to eliminate injuries by promoting safety training and the use of protective equipment, such as safety glasses and metal helmets.

Most boilermaking workers belong to labor unions. The principal union is the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers. Other workers are members of the Industrial Union of Marine and Shipbuilding Workers of America; the Oil, Chemical and Atomic Workers International Union; and the United Steelworkers of America.

Sources of Additional Information

For further information regarding boilermaking apprenticeships or other training opportunities, contact local offices of the unions previously mentioned, local construction companies and boiler manufacturers, or the local office of the State employment service.

BOILER TENDERS

(D.O.T. 951.885)

Nature of the Work

Boiler tenders operate and maintain the steam boilers that power industrial machinery and heat factories, offices, and other buildings. They also may operate waste heat boilers that burn trash and other solid waste.

Boiler tenders control the mechanical or automatic devices that regulate the flow of air and fuel into the combustion chambers. They may, for example, start the pulverizers or stokers to feed coal into the firebox or start the oil pumps and heaters to ignite burners.

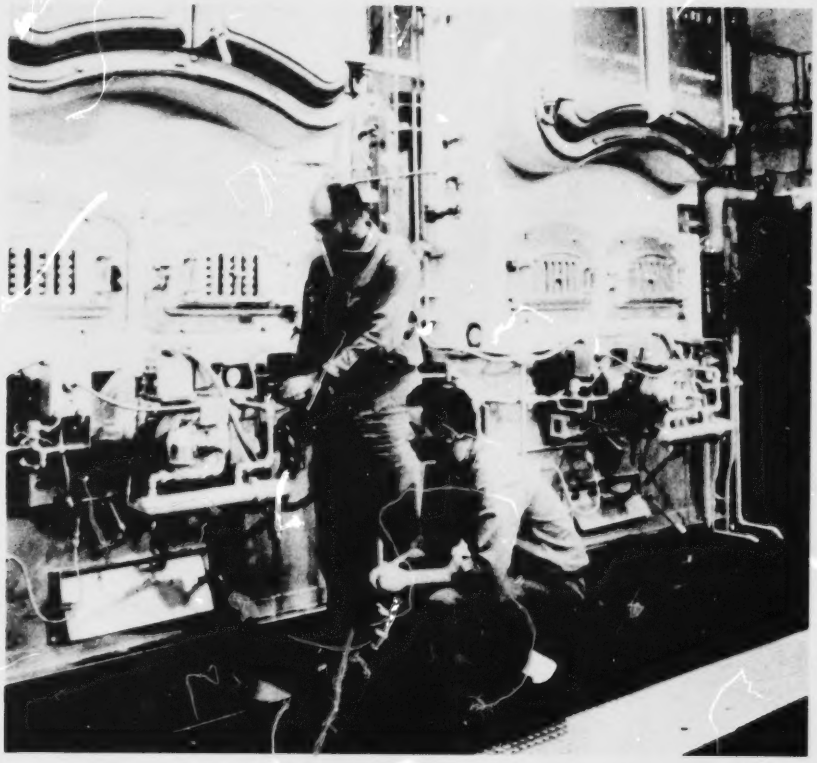
These workers may be responsible for inspecting and maintaining boiler equipment. This includes reading meters and gauges attached to the boilers to ensure safe operation. Sometimes boiler tenders make minor repairs, such as packing valves or replacing faulty indicators.

Boiler tenders also chemically test and treat water for purity. In this way, they prevent corrosion of the boiler and buildup of scale.

Boiler tenders often are supervised by stationary engineers who operate and maintain a variety of equipment, including boilers, diesel and steam engines, and refrigeration and air-conditioning systems. (Additional information on stationary engineers appears elsewhere in the *Handbook*.)

Places of Employment

About one-half of the 73,000 boiler tenders employed in 1976 worked in factories. Plants that manufacture lumber, iron and steel, paper, chemicals, and stone, clay, and glass products are among the leading employers of boiler tenders. Public utilities also employ many of these workers.



Boiler tenders may advance to stationary engineers.

Many others worked in hospitals, schools, and Federal, State, and local governments.

Although boiler tenders are employed in all parts of the country, most work in the more heavily populated areas where large manufacturing plants are located.

Training, Other Qualifications, and Advancement

Some large cities and a few States require boiler tenders to be licensed. An applicant can obtain the knowledge and experience to pass the license examination by first working as a helper in a boiler room. Applicants for helper jobs should be in good physical condition and have mechanical aptitude and manual dexterity. High school courses in mathematics, motor mechanics, chemistry, and blueprint reading also are helpful to persons interested in becoming boiler tenders.

There are two types of boiler tenders' licenses—for low pressure and high pressure boilers. Low pressure tenders operate boilers generally used for heating buildings. High pressure tenders operate the more powerful boilers and auxiliary boiler equipment used to power machinery in factories as well as heat large buildings, such as high-rise apartments. Both high and low pressure tenders, however, may operate equipment of any pressure if a stationary engineer is on duty.

Due to regional differences in licensing requirements, a boiler tender who moves from one State or city to another may have to pass an examination for a new license. However, the National Institute for Uniform Licensing of Power Engineers is currently assisting many State licensing agencies in adopting uniform licensing requirements that would eliminate this problem by establishing reciprocity of licenses.

Boiler tenders may advance to jobs as stationary engineers. To help them advance, they sometimes supplement their on-the-job training by taking courses in chemistry, physics, blueprint reading, electricity, and air-conditioning and refrigeration. Boiler tenders also may become maintenance mechanics.

Employment Outlook

Employment of boiler tenders is expected to decline through the mid-1980's as more new boilers are equipped with automatic controls. Nevertheless, a few thousand openings will result each year from the need to replace experienced tenders who retire, die, or transfer to other occupations.

Earnings and Working Conditions

Boiler tenders had average hourly earnings of $6.20, according to a survey of 19 metropolitan areas in 1976. This was higher than the average for all nonsupervisory workers in private industry, except farming. The average for tenders in individual areas ranged from $3.63 in Greenville, S.C., to $7.48 in Detroit, Mich.

Modern boiler rooms usually are clean and well-lighted. However, boiler tenders may have to work in awkward positions and be exposed to noise, heat, grease, fumes, and smoke. They also are subject to burns, falls, and injury from defective boilers or moving parts, such as pulverizers and stokers. Modern equipment and safety procedures, however, have reduced accidents.

The principal unions organizing boiler tenders are the International Brotherhood of Firemen and Oilers and the International Union of Operating Engineers.

Sources of Additional Information

Information about training or work opportunities in this trade is available from local offices of State employment services, locals of the International Brotherhood of Firemen and Oilers, locals of the International Union of Operating Engineers, and from State and local licensing agencies.

Specific questions about the nature of the occupation, training, and employment opportunities may be referred to:

National Association of Power Engineers, Inc., 176 West Adams St., Chicago, Ill. 60603.

International Union of Operating Engineers, 1125 17th St. NW., Washington, D.C. 20036.

For information concerning reciprocity of boiler tenders' licenses among various cities and States, contact:

National Institute for Uniform Licensing of Power Engineers, 176 West Adams St., Suite 1911, Chicago, Ill. 60603.

ELECTROPLATERS

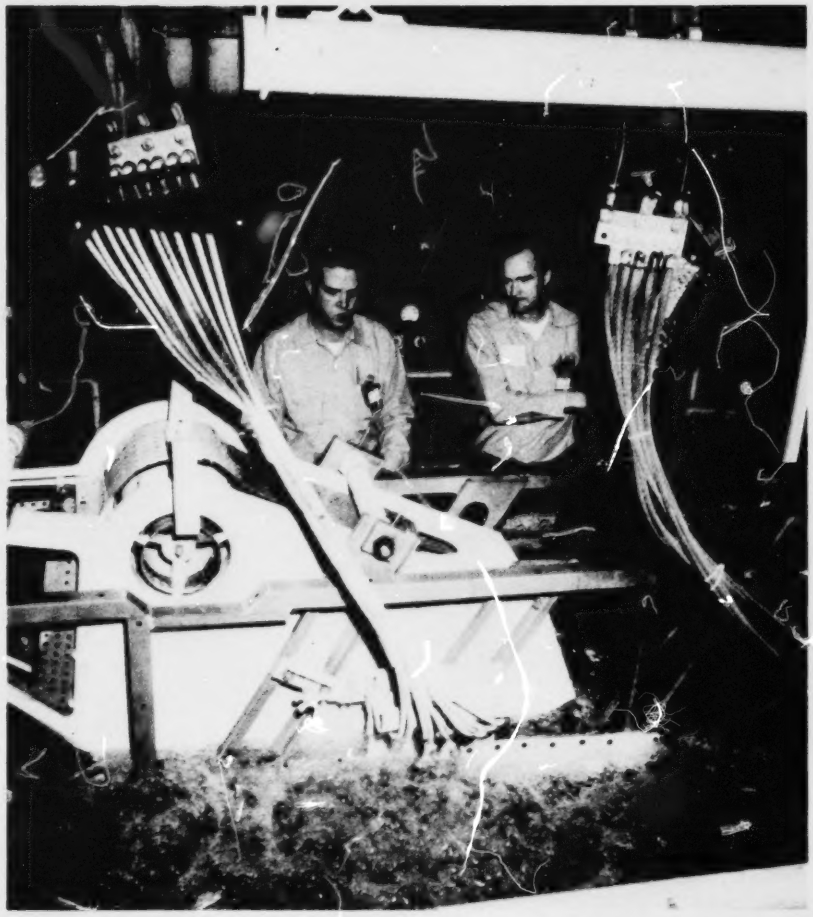
(D.O.T. 500.380 and .781 through .884)

Nature of the Work

Electroplating is a commonly used manufacturing process that gives metal or plastic articles a protective surface or an attractive appearance. Products that are electroplated include items as different as automobile bumpers, silverware, costume jewelry, and jet engine parts. In all cases, however, the object being plated is connected to one end of an electric circuit and placed in an appropriate solution. The other end of the electric circuit is connected to the plating material. By controlling the amount of electricity that flows from the plating material through the solution and to the object being plated, electroplaters control the amount of chromium, nickel, silver, or other metal that is applied to the final product.

Prior to electroplating any object, electroplaters study the job specifications which indicate the parts of the objects to be plated, the type of plating metal to be applied, and the desired thickness of the plating. Following these specifications, they prepare the plating solution by carefully adding the proper amounts and types of chemicals.

In preparing an article for electroplating, platers may first cover parts of it with lacquer, rubber, or tape to keep these parts from being exposed to the plating solution. They then either scour the article or dip it into a cleaning bath to remove dirt and grease before putting it into the solution.



Electroplaters dip aircraft wing pivot in plating solution.

Electroplaters must carefully inspect their work for defects such as minute pits and nodules. They may use a magnifying glass to examine the surface and micrometers and calipers to check the plating thickness.

Skill requirements and work performed vary by type of shop. All-round platers in small shops analyze solutions, do a great variety of plating, calculate the time and current needed for various types of plating, and perform other technical duties. They also may order chemicals and other supplies for their work. Platers in larger shops usually carry out more specialized assignments that require less extensive knowledge.

Places of Employment

About 36,000 people worked as electroplaters in 1976. About half of them worked in shops that specialized in metal plating and polishing for manufacturing firms and other customers. Virtually all of the remaining platers worked in plants that manufactured plumbing fixtures, cooking utensils, household appliances, electronic components, motor vehicles, and other metal products. The Federal Government employed a few platers for maintenance purposes at a number of military and civilian installations.

Electroplaters work in almost every part of the country, although most work in the Northeast and Midwest, near the centers of the metalworking industry. Large numbers of electroplaters work in Los Angeles,

San Francisco, Chicago, New York, Detroit, Cleveland, Providence, and Newark.

Training, Other Qualifications, and Advancement

Most electroplaters learn the trade on the job by helping experienced platers. It usually takes at least 3 years to become an all-round plater. Platers in large shops usually are not required to have an all-round knowledge of plating, and can learn their jobs in much less time. However, workers who receive such limited training generally have difficulty in transferring to shops doing electroplating with metals outside their specialty.

A small proportion of electroplaters receive all-round training by working 3 or 4 years as an apprentice. Apprenticeship programs combine on-the-job training and related classroom instruction in the properties of metals, chemistry, and electricity as applied to plating. Apprentices do progressively more difficult work as their skill and knowledge increase. By the third year, they determine cleaning methods, do plating without supervision, make solutions, examine plating results, and direct helpers. Qualified platers may become supervisors. Some electroplaters who understand the chemical processes of electroplating and the chemical characteristics of metals, and who have an outgoing personality, may become sales representatives for metal products wholesalers or manufacturers. Electroplaters with the necessary capital may go into business for themselves.

A few people take a 1- or 2-year electroplating course in a junior college, technical institute, or vocational high school. In addition, many branches of the American Electroplaters Society give basic courses in electroplating. Persons who wish to become electroplaters will find high school or vocational school courses in chemistry, electricity, physics, mathematics, and blueprint reading helpful.

Employment Outlook

Employment of electroplaters is expected to grow more slowly than the average for all occupations through the mid-1980's. Besides employment growth, other openings will result from the need to replace experienced workers who retire, die, or leave the occupation for other reasons. Opportunities are expected to be favorable for individuals who want jobs as electroplaters.

Expansion of the metalworking industries and the electroplating of a broadening group of metals and plastics are expected to increase the need for electroplaters. However, employment growth will be somewhat restricted by the increasing application of automated plating equipment and water effluent standards established by the Environmental Protection Agency. Such standards will require plants to install equipment with additional water pollution controls to prevent pollution of streams and waters. This new non-polluting plating equipment will increase cost of electroplating and thus will reduce the demand for electroplated products and electroplaters.

Earnings and Working Conditions

Hourly wage rates for electroplaters ranged from $2.75 to $9.80 in 1976, according to the limited information available. During apprenticeship or on-the-job training, a worker's wage rate starts at about 60 to 70 percent of an experienced worker's rate and progresses to the full rate by the end of the training period. Electroplaters normally receive premium pay for working night shifts.

Occupational hazards associated with plating work include burns from splashing acids and inhalation of toxic fumes. Humidity and odor also are problems in electroplating plants. However, most plants have ventilation systems and other safety devices that have reduced occupational hazards. Protective clothing and boots provide additional protection. Electroplaters are on their feet most of their workday and do much reaching, lifting, bending and carrying. Generally, mechanical devices are used for lifting, but at times the worker must lift and carry objects weighing up to 100 pounds.

Some platers are members of the Metal Polishers, Buffers, Platers and Helpers International Union. Other platers have been organized by the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America, and the International Association of Machinists and Aerospace Workers.

Sources of Additional Information

Information on the availability of apprenticeships or on-the-job training may be obtained from State employment offices and local union offices. Training opportunities may also be located by contacting manufacturing plants and job shops that do electroplating.

For more specific information about job opportunities and training, write to:

American Electroplaters Society, Inc., 1201 Lousiana Avenue Winter Park, Florida 23609.

National Association of Metal Finishers, 22 South Park, Montclair, N.J. 07042.

INDUSTRIAL MACHINERY REPAIRERS

(D.O.T. 626. Through 631.)

Nature of the Work

When a machine breaks down in a plant or factory, not only is the machine idle, but raw materials and human resources are wasted. It is the industrial machinery repairer's job to prevent these costly breakdowns and to make repairs as quickly as possible.

Industrial machinery repairers—often called maintenance mechanics—spend much time doing preventive maintenance. This includes keeping machines well oiled and greased, and periodically cleaning parts. The repairer regularly inspects machinery and checks performance. Tools such as micrometers, calipers, and depth gauges are used to measure and align all parts. For example, on sewing machines in the apparel industry, treadles may need adjustment and gears and bearings may have to be aligned. By keeping complete and up-to-date records, mechanics can anticipate trouble and hopefully service machinery before

the factory's production is interrupted.

When repairs become necessary, the maintenance mechanic must first locate the specific cause of the problem. This challenge requires knowledge reinforced by instinct. For example, after hearing a vibration from a machine, the mechanic must decide whether it is due to worn belts, weak motor bearings, or any number of other possibilities. Repairers often follow blueprints and engineering specifications in maintaining and fixing equipment.

After correctly diagnosing the problem, the maintenance mechanic disassembles, and then repairs or replaces the necessary parts. Hand and power tools usually are needed. The repairer may use a screwdriver and a wrench to take the door off an oven or a crane to lift a printing press off the ground. Electronic testing equipment often is included in the mechanic's tools. Repairers use catalogs to order replacements for broken or defective parts. When parts are not readily available, or when a machine must be quickly returned to production, repairers may sketch a part that can be fabricated by the plant's machine shop.

The repairer reassembles and tests each piece of equipment after it has been serviced, for once it is back in operation, the machine is expected to work as if it were new.

Many of the industrial machinery repairer's duties, especially preventive maintenance, also are performed by millwrights. (See statement on millwrights elsewhere in the *Handbook*.)

Places of Employment

Industrial machinery repairers work in almost every industry that uses large amounts of machinery. Many of the 320,000 repairers employed in 1976 worked in the following manufacturing industries: food products, primary metals, machinery, chemicals, fabricated metal products, transportation equipment, paper, and rubber.

Because industrial machinery repairers work in a wide variety of plants, they are employed in every section of the country. Employment is concentrated, however, in heavily industrialized areas.

Training, Other Qualifications, and Advancement

Most workers who become industrial machinery repairers start as helpers and pick up the skills of the trade informally, through several years of experience. Others learn the trade through formal apprenticeship programs. Apprenticeship training usually lasts 4 years and consists of both on-the-job training and related classroom (or correspondence school) instruction in subjects such as shop mathematics, blueprint reading, welding, and safety. Upgrade examinations may be administered periodically to determine the repairer's ability to maintain more advanced machinery. Some repairers are promoted to machinists or tool and die makers. A few become master mechanics.

Mechanical aptitude and manual dexterity are important qualifications for workers in this trade. Good physical condition and agility also are necessary because repairers sometimes have to lift heavy objects or do considerable climbing to reach equipment located high above the floor.

High school courses in mechanical drawing, mathematics, and blueprint reading are recommended for those interested in entering this trade.

Employment Outlook

Employment of industrial machinery repairers is expected to increase much faster than the average for all occupations through the mid-1980's. In addition to jobs from employment growth, many openings will result from the need to replace experienced repairers who retire, die, or transfer to other occupations.

More repairers will be needed to take care of the growing amount of machinery used in manufacturing, coal mining, oil exploration, and other industries. In addition, as machinery becomes more complex, repair work and preventive maintenance will become more essential.

Earnings and Working Conditions

According to a survey of metropolitan areas, hourly wages for industrial machinery repairers averaged $6.47 in 1976—one-third higher than the average for all nonsupervisory workers in private industry, except farm-

Industrial machinery repairers need agility.

ing. Average hourly earnings of industrial machinery repairers in 12 areas that represent various regions of the country are shown in the following tabulation:

Area	*Hourly rate*
Detroit	$7.66
Indianapolis	7.18
Baltimore	7.13
Chicago	6.89
Houston	6.80
New York	6.33
Cincinnati	6.27
Minneapolis—St. Paul	6.24
St. Louis	6.19
New Orleans	5.71
Worcester, Mass.	5.59
Greenville—Spartanburg, S.C.	4.76

Industrial machinery repairers usually are not affected by seasonal changes in production. During slack periods when some plantworkers are laid off, repairers often are retained to do major overhaul jobs.

Industrial machinery repairers may be called to the plant during off-duty hours, especially in emergencies. Thus they may have to work nights and weekends, depending on the maintenance necessary.

Repairers may work in stooped or cramped positions, to reach the underside of a generator, for example. They also may find it necessary to work from the top of ladders when repairing a large machine. These workers are subject to common shop injuries such as cuts and bruises. Goggles, metal-tip shoes, safety helmets, and other protective devices help prevent injuries.

Labor unions to which most industrial machinery repairers belong include the United Steelworkers of America; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Association of Machinists and Aerospace Workers; and the International Union of Electrical, Radio and Machine Workers.

Sources of Additional Information

Information about employment and apprenticeship opportunities in this field may be available from local offices of the State employment service or the following organizations:

International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America, 8000 East Jefferson Ave., Detroit, Mich. 48214.

International Union of Electrical, Radio, and Machine Workers, 1126-16th St. NW., Washington, D.C. 20036.

INSPECTORS (MANUFACTURING)

Nature of the Work

Most products—including the things we eat, drink, wear, and ride in—are checked by inspectors sometime during the manufacturing process to make sure they are of the desired quality. Inspectors also check the quality of the raw materials and parts that make up finished goods.

A variety of methods are used to make certain that products meet specifications. Inspectors may taste-test a soft drink or examine a jacket for flaws, imperfections, or defects. They may use tools such as micrometers, protractors, gauges, and magnifying glasses to make sure that airplanes are assembled properly. Inspectors frequently make simple calculations to measure parts and examine work orders or blueprints to verify that products conform to standards.

Semiskilled inspectors usually work under close supervision, whereas skilled inspectors generally have more responsibility and less supervision. For example, skilled inspectors usually have authority to accept or reject most products, and often analyze the reasons for faulty construction and recommend corrective action. Skilled inspectors also may

Inspectors use a variety of instruments to test product quality.

know how to use a wider variety of complex testing instruments.

Some inspectors make minor repairs and adjustments, such as filing a rough edge or tightening a bolt, and grade products for quality. In many plants, when the number of rejected items rises above a certain proportion, inspectors notify their supervisors.

Places of Employment

About 692,000 inspectors were employed in 1976. Two-thirds worked in plants that produced durable goods such as machinery, transportation equipment, electronics equipment, and furniture. Others worked in plants that produced goods such as textiles, apparel, and leather products.

Inspectors worked in every part of the country, although they were concentrated in the industrialized States. Almost two-thirds were found in Ohio, New York, Michigan, Illinois, Pennsylvania, California, New Jersey, North Carolina, and Indiana.

Training, Other Qualifications, and Advancement

Inspectors generally are trained on the job for a brief period—from a few hours or days to several months, depending upon the skill required.

Employers look for applicants who have good health and eyesight—with or without glasses—and who can follow directions and concentrate on details. Applicants should be able to get along with people since inspectors occasionally work as part of a team. A few large companies give preemployment tests to check skills such as the ability to work with numbers. Some employers may hire applicants who do not have a high school diploma but who have qualifying aptitudes or related experience. Other employers prefer experienced workers for inspection jobs. Many inspectors acquire the necessary skills and experience by working at various production line jobs, especially assembling.

Some semiskilled inspectors—particularly in metalworking industries—who take courses, such as blueprint reading and shop mathematics, may advance to skilled inspectors. After acquiring sufficient experience and knowledge, a few become quality control technicians or supervisors.

Employment Outlook

Employment of inspectors is expected to increase faster than the average for all occupations through the mid-1980's, with thousands of openings each year. As population and personal incomes grow, most manufacturing industries are expected to increase their output, and thus employment in the long run. This business growth will create a need for more industrial machinery and equipment. Additionally, the growing complexity of manufactured products should result in a need for more inspectors. Many openings will result as workers retire, die, or transfer to other occupations.

Inspectors seeking jobs in companies that produce durable goods, which are particularly sensitive to changes in business conditions, may find jobs scarce in some years, plentiful in others.

Earnings and Working Conditions

Wages for inspectors ranged from $2.70 to $7.02 an hour in 1976, according to information from a limited number of union contracts. Most inspectors covered by these contracts earned between $3.50 and $5.50 an hour.

Working conditions vary considerably for inspectors. For example, some have well lighted, air-conditioned workplaces in an aircraft or missile plant; others, who work on the production floor of a machinery or metal fabricating plant, often are exposed to high temperatures, oil, grease, and noise.

Many inspectors are members of labor unions, including the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Association of Machinists and Aerospace Workers; the International Union of Electrical, Radio and Machine Workers; the International Brotherhood of Electrical Workers; United Steelworkers; and the Allied Industrial Workers of America.

Sources of Additional Information

Information about employment opportunities in this field may be available from State employment service offices.

The American Society for Quality Control certifies quality technicians. They also publish a careers booklet called "Careers in the Quality Sciences," which describes the occupation of inspector and includes information on quality engineering and management careers as well. For information about the test required for certification, or for a free copy of the booklet, write to:

American Society for Quality Control, 161 West Wisconsin Ave., Milwaukee, Wis. 53203.

MAINTENANCE ELECTRICIANS

(D.O.T. 825.281 and 829.281)

Nature of the Work

Maintenance electricians keep lighting systems, transformers, generators, and other electrical equipment in good working order. They also may install new electrical equipment.

Duties vary greatly, depending on where the electrician is employed. Electricians who work in large factories may repair particular items such as motors and welding machines. Those in office buildings and small plants usually fix all kinds of electrical equipment. Regardless of location, electricians spend much of their time doing preventive maintenance—periodic inspection of equipment to locate and correct defects before breakdowns occur. When trouble occurs, they must find the cause and make repairs quickly to prevent costly production losses. In emergencies, they advise management whether continued operation of equipment would be hazardous.

Maintenance electricians make repairs by replacing items such as a

fuse, switch, or wire. When replacing a wire, they first make sure the power is off. Workers then pull the old wire from the conduit (a pipe or tube) and pull the new wire through to replace the old. Once the new wire is connected, they test to make sure the circuit is complete and functioning properly.

Maintenance electricians sometimes work from blueprints, wiring diagrams, or other specifications. They use meters and other testing devices to locate faulty equipment. To make repairs they use pliers, screwdrivers, wirecutters, drills, and other tools.

More than half of all maintenance electricians work in manufacturing industries.

Places of Employment

An estimated 300,000 maintenance electricians were employed in 1976. More than half of them worked in manufacturing industries; large numbers worked in plants that make automobiles, machinery, chemicals, aluminum, and iron and steel. Many maintenance electricians also were employed by public utilities, mines, railroads, and by Federal, State, and local governments.

Maintenance electricians are employed in every State. Large numbers work in heavily industrialized States such as California, New York, Pennsylvania, Illinois, and Ohio.

Training, Other Qualifications, and Advancement

Most maintenance electricians learn their trade on the job or through formal apprenticeship programs. A relatively small number learn the trade in the Armed Forces. Training authorities generally agree that apprenticeship gives trainees more thorough knowledge of the trade and improved job opportunities during their working life. Because the training is comprehensive, people who complete apprenticeship programs may qualify either as maintenance or construction electricians.

Apprenticeship usually lasts 4 years, and consists of on-the-job training and related classroom instruction in subjects such as mathematics, electrical and electronic theory, and blueprint reading. Training may include motor repair, wire splicing, installation and repair of electronic controls and circuits, and welding and brazing.

Although apprenticeship is the preferred method of training, many people learn the trade informally on the job by serving as helpers to skilled maintenance electricians. Helpers begin by doing simple jobs such as replacing fuses or switches and, with experience, advance to more complicated jobs such as splicing and connecting wires. They eventually get enough experience to qual-

ify as electricians. This method of learning the trade, however, may take more than 4 years.

Persons interested in becoming maintenance electricians can obtain a good background by taking high school or vocational school courses in electricity, electronics, algebra, mechanical drawing, shop, and science. To qualify for an apprenticeship program, an applicant must be at least 18 years old and usually must be a high school or vocational school graduate with 1 year of algebra.

Although physical strength is not essential, manual dexterity, agility, and good health are important. Good color vision is necessary because electrical wires frequently are identified by color.

All maintenance electricians should be familiar with the National Electric Code and local building codes. Many cities and counties require maintenance electricians to be licensed. Electricians can get a license by passing an examination that tests their knowledge of electrical theory and its application.

Some maintenance electricians become supervisors. Occasionally, they advance to jobs such as plant electrical superintendent or plant maintenance superintendent.

Employment Outlook

Employment of maintenance electricians is expected to increase about as fast as the average for all occupations through the mid-1980's. This growth will stem from increased use of electrical and electronic equipment by industry. In addition to the jobs from employment growth, a few thousand openings will arise each year to replace experienced electricians who retire, die, or transfer to other occupations.

Growth in the number of job openings is expected to be fairly steady in the years ahead since the demand for maintenance electricians is not very sensitive to ups and downs in the economy. At times when construction activity is depressed, however, beginners may face competition for job openings because some unemployed construction electricians apply for these openings.

Earnings and Working Conditions

Earnings of maintenance electricians compare favorably with those of other skilled workers. In 1976, based on a survey of metropolitan areas, maintenance electricians averaged about $6.95 an hour, ranging from $4.84 in Greenville, S.C., to $8.02 in Indianapolis. By comparison, all production and nonsupervisory workers in private industry, except farming, averaged $4.87.

Apprentices start at about 60 percent of the skilled electrician's hourly pay rate and receive increases every 6 months.

During a single day, an electrician may repair equipment both in a clean, air-conditioned office and on a factory floor, surrounded by the noise, oil, and grease of machinery. Electricians often climb ladders or work on scaffolds in awkward or cramped positions.

Because maintenance electricians work near high-voltage industrial equipment, they must be alert and accurate. Errors in wiring installations could endanger both the electrician and other employees. Safety principles, which are a part of all electrician training programs, have reduced the frequency of accidents. Electricians are taught to use protective equipment and clothing, to respect the destructive potential of electricity, and to fight small electrical fires.

Among unions organizing maintenance electricians are the International Brotherhood of Electrical Workers; the International Union of Electrical, Radio and Machine Workers; the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (Ind.); and the United Steelworkers of America.

Sources of Additonal Information

Information about apprenticeships or other work opportunities in the trade is available from local firms that employ maintenance electricians, and from local union-management apprenticeship committees. In addition, the local office of the State employment service may provide information about training opportunities. Some State employment service offices screen applicants and give aptitude tests.

MILLWRIGHTS

(D.O.T. 638.281)

Nature of the Work

With the coming of the Industrial Revolution, machines replaced many handcrafted items and new and bigger factories became necessary. The textile industry in England was one of the first to use machinery to mass produce its goods. The workers who planned and built these textile mills, and set up the equipment that was needed, were called millwrights. The occupation gradually expanded to other factories, and today the millwright installs all types of machinery in almost every industry.

The millwright is a skilled craftworker who may perform any or all of the tasks involved in preparing machinery for use in a plant. This often includes construction of concrete foundations or wooden platforms on which heavy machines are mounted. As they either personally prepare or supervise the construction of these structures, millwrights must know how to read blueprints and work with various building materials.

Millwrights also may have to dismantle existing equipment, for instance when it becomes obsolete or to make better use of factory space. Wrenches, hammers, pliers, metal cutting torches, and other hand and power tools are used to loosen and disassemble parts.

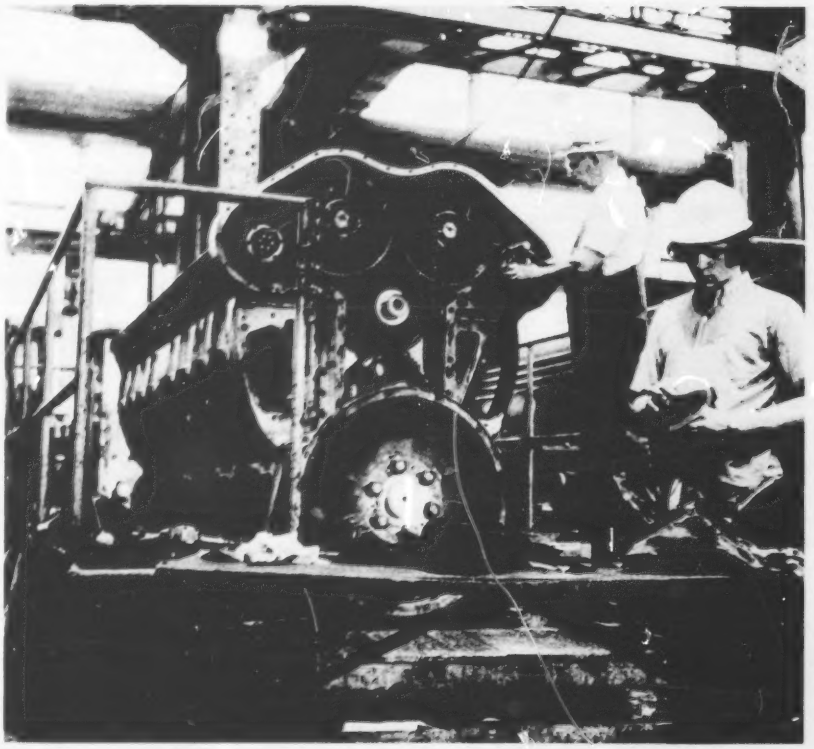
To aid in moving machinery, the millwright may use any number of rigging devices. For example, to install a new oven in a food processing plant, millwrights may use a hoist or a small crane to move the oven from the truck on which it arrived to a conveyor which would carry it into the plant. Then it may be lifted, with the aid of a crowbar for leverage,

onto a dolly and taken to a foundation for proper positioning.

In assembling machinery, millwrights fit bearings, align gears and wheels, attach motors and connect belts to prepare a machine for use. Mounting and assembling a piece of equipment requires tools similar to those used in the dismantling process. When precision leveling is necessary, many measuring devices must be used. To set up automatic pinsetting equipment in a bowling alley, for example, plumb bobs—or weights which determine perpendicularity—must be attached. Millwrights also use squares to test right angles and calipers to measure diameter and thickness.

Many of the millwright's duties also are performed by industrial machinery repairers. (See the statement on industrial machinery repairers elsewhere in the *Handbook*.) This includes preventative maintenance, such as keeping machinery regularly oiled and greased, and fixing or replacing worn parts.

Millwrights employed by contract installation and construction companies do a variety of installation work. Those employed in factories usually specialize in installing the particular types of machinery used by their employers. They also may maintain plant equipment such as conveyors and cranes.



Apprenticeship programs for millwrights generally last 4 years.

Places of Employment

Most of the estimated 96,000 millwrights employed in 1976 worked for manufacturing companies; the majority were in transportation equipment, metal, paper, lumber, and chemical products industries. Others worked for contractors in the construction industry. Machinery manufacturers employed a small number to install equipment in customers' plants.

Millwrights work in every State. However, employment is concentrated in heavily industrialized areas such as Detroit, Pittsburgh, Cleveland, Buffalo, and the Chicago-Gary area.

Training, Other Qualifications, and Advancement

Some millwrights start as helpers to skilled workers and learn the trade informally on the job. This process generally takes 6 to 8 years. Others learn through formal apprenticeship programs which last 4 years. Apprenticeship programs include training in dismantling, moving, erecting, and repairing machinery. Helpers also may work with concrete and receive instruction in related skills such as carpentry, welding, and sheet-metal work. Classroom instruction is given in shop mathematics, blueprint reading, hydraulics, electricity, and safety.

Applicants for apprentice or helper jobs must be at least 17 years old. Some employers prefer to hire high school or vocational school graduates. Courses in science, mathematics, mechanical drawing, and machine shop practice are useful. Because millwrights often put together and take apart complicated machinery, mechanical aptitude is important. Strength and ability also are important, because the work requires a considerable amount of lifting and climbing.

Employment Outlook

Employment of millwrights is expected to increase about as fast as the average for all occupations through the mid-1980's. Employment will increase as new plants are built, as existing plant layouts are improved, and as increasingly complex machinery is installed and maintained. Besides job openings from employment growth, thousands of openings will arise annually as experienced millwrights retire, die, or transfer to other occupations

Earnings and Working Conditions

According to a survey of metropolitan areas, hourly wages for millwrights averaged $7.25 in 1976—more than one-third higher than the average wage for all nonsupervisory

workers in private industry, except farming. Earnings for millwrights in 11 areas that represent various regions of the country appear in the accompanying tabulation:

Area	Hourly rate
Indianapolis	$7.81
Detroit	7.63
Houston	7.33
Baltimore	7.30
Cincinnati	7.21
Chicago	6.99
St. Louis	6.90
Minneapolis—St. Paul	6.75
New York	6.68
New Orleans	6.11

Millwrights employed by factories ordinarily work year round. Those employed by construction companies and companies that manufacture and install machinery may experience periods of unemployment; however, they usually are compensated with a higher hourly wage rate. Frequently these millwrights must travel.

The work of millwrights involves some hazards. For example, there is the danger of being struck by falling objects or machinery that is being moved. There also is the danger of falling from high workplaces, for millwrights must often climb up walkways and platforms to install equipment. In addition, millwrights are subject to usual shop hazards such as cuts and bruises. Accidents have been reduced by the use of protective devices such as safety belts and hats.

Most millwrights belong to labor unions, among which are the International Association of Machinists and Aerospace Workers; United Brotherhood of Carpenters and Joiners of America (construction millwrights); United Steelworkers of America; International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; United Paperworkers International Union; the International Union of Electrical, Radio and Machine Workers; and the International Brotherhood of Firemen and Oilers.

Sources of Additional Information

For further information on apprenticeship programs, write to the Apprenticeship Council of your State's labor department, local offices of your State employment service, local firms that employ millwrights or:

United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, D.C. 20001.

POWER TRUCK OPERATORS

(D.O.T. 922.883)

Nature of the Work

In the past, workers usually did the hard physical labor of moving materials and products. Today, many materials and products are moved by workers who operate various types of power trucks.

A typical power truck has a hydraulic lifting mechanism and forks to carry a load on a wooden skid or pallet, or other attachments to make it more versatile. For example, a truck may have a clamp lift to move cartons, bales, or paper rolls, a scoop to lift coal, or a tow bar to pull warehouse trailers.

Because the trucks are steered by the rear wheels and start and stop very quickly, operators must use care and skill in driving. Power trucks are relatively easy to operate; however, operators usually must follow special procedures when using a truck at a plant, warehouse, or construction site. For example, forks must be kept down if the truck is driven without a load. If the load is too high or wide to see around, the operator must drive the truck in reverse. When loading or removing materials that are stacked on the floor or a platform, drivers must judge distance accurately and operate the truck smoothly so that no damage occurs to the stock. Operators also must know the lifting capacity of the truck and the kinds of jobs it can do.

Operators may have to keep records of materials moved and do some manual loading and unloading. They also may be responsible for keeping their trucks in good working condition by cleaning and oiling them, checking the water in batteries, making simple adjustments, and reporting any mechanical problems.

Places of Employment

About 360,000 persons worked as power truck operators in 1976. About three-fourths of them worked in manufacturing industries. Large numbers were employed in plants that made automobiles, machinery, fabricated metal products, paper, building materials, and iron and steel. Many power truck operators also were employed in warehouses, depots, freight and marine terminals, and mines.

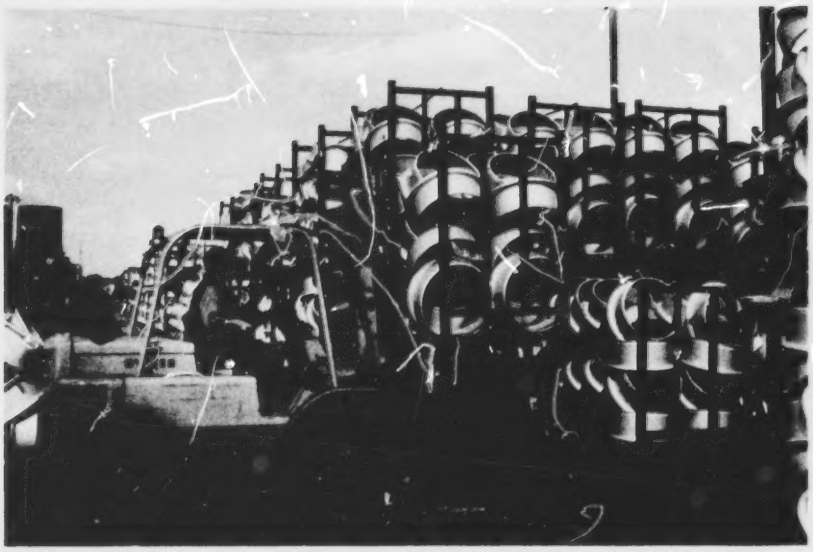
Power truck operators are employed in all parts of the country. Although some are employed in small towns, most work in heavily populated areas where large factories are located.

Training, Other Qualifications, and Advancement

Power truck operators train on the job. Most workers can learn to operate a power truck in a few days. It takes several weeks, however, to learn the layout of the plant, the rules for operating a truck in the plant, and the most efficient way of handling materials.

Many companies have training programs that include classroom instruction and practice with the power truck. In the classes trainees learn how the vehicle and its lift operate, proper methods of transporting materials, simple maintenance procedures, and safe driving rules. The programs stress practice with the power trucks. Trainees even may be required to operate them on an obstacle course. Training programs last 1 to 5 days. Because power trucks are becoming more versatile and expensive, firms are expected to place greater emphasis on training programs to increase the skills of their operators in order to avoid damage to trucks and materials from accidents.

Employers seek applicants who have average manual dexterity, strength, and stamina because operators must get on and off the truck frequently and occasionally load and



Power truck operators are employed in many industries.

unload material. Good eyesight, including good depth preception, is required to pick up, move, and deposit loads with the power truck. Large companies generally require applicants to pass a physical examination. Some mechanical ability is helpful because operators often are required to perform minor maintenance on their power trucks.

Opportunities for advancement are limited. A few operators may become supervisors.

Employment Outlook

Employment of power truck operators is expected to increase about as fast as the average for all occupations through the mid-1980's. In addition to jobs resulting from employment growth, many operators will be needed to replace those who retire, die, or transfer to other occupations.

More goods will be manufactured as the population grows and our standard of living rises, and more power truck operators will be needed to move these goods and the materials used to produce them. The need for operators also will increase as more firms use power trucks in place of hand labor to move materials. The number of jobs available annually will vary, because the occupation is sensitive to changes in the demand for manufactured goods.

Earnings and Working Conditions

In 1976, power truck operators in manufacturing earned an average of $5.30 an hour, slightly above the average for nonsupervisory workers in private industry, except farming. Earnings of operators varied slightly by region and by industry.

Power truck operators are subject to hazards such as collisions and falling objects. They may operate their trucks outdoors where they are exposed to all kinds of weather. Some operators transport loose material that is dirty or dusty.

A trend toward quieter, more comfortable, and better handling trucks and emphasis on training in safe operation have improved working conditions. For example, all rider type power trucks now have overhead guards and many which are used outdoors are equipped with all-weather cabs. Also, the increasing use of the relatively noiseless and pollutant-free battery-powered trucks is doing much to improve the comfort of the operator. Moving materials throughout a plant also is likely to be less routine and boring than many other production jobs.

Sources of Additional Information

Information on work opportunities for power truck operators may be available from the local office of the State employment service.

PRODUCTION PAINTERS

Nature of the Work

Almost every metal or wood product manufactured gets a coating of paint or other finish before it leaves the factory. Automobiles, for example, usually receive rust preventative, primer, and paint totaling at least 10 coats. Even pencils are dipped in paint several times before they are packed into boxes.

The workers who apply the varnish, lacquer, paint, and other finishes used in factories are called production painters. Because they generally work on assembly lines, production painters' skills are different from those of painters who repair damaged cars in body shops and from those who paint newly constructed buildings. (Information on these painters can be found in separate statements elsewhere in the *Handbook*.) The majority of production painters use sprayguns to apply finishes; while the rest operate automatic painting machinery, such as spraying machines, dipping tanks, and tumbling barrels. Since painters may spray hundreds of identical items a day, the work may become repetitious.

Painters mix the paint at the beginning of the process. They first figure areas to be covered, and then follow directions to blend paint to its correct color and thickness. These steps require simple arithmetic involving decimals and fractions. Viscosity me-

Most paint is applied with spray guns.

ters are used to make sure the paint is the right consistency, for if it is too thick or too thin, the paint has to be mixed over. Pressure of the spray gun nozzles and spray pattern controls also must be adjusted properly to ensure that the paint is evenly applied.

Besides spraying, painters are responsible for other duties on the production line. If an object is to be multi-colored, masking tape must be applied to keep colors from overlapping. Production painters who operate machinery set up the painting equipment at the beginning of the shift and are responsible for keeping it running. Other machines used in the painting process may also be operated by the painters. For example, washing tanks are used to clean items prior to painting and baking ovens dry the painted articles. At the end of the shift, painters must clean spray guns and other equipment used, such as mixing paddles and gauges which check paint consistency.

An increasing number of production lines use automatic painting machinery. Here, production painters are necessary to check for imperfections and to paint parts of an article that the machine misses. For example, some modern applicators cannot paint inside surfaces, such as the interior of a bucket. Painters use spray guns to paint these areas. As production lines become more automated, painters must learn to handle all types of modern painting machinery, such as electrostatic applicators and powder-type painting systems.

Places of Employment

About 104,000 production painters were employed in 1976. About two thirds of the total worked in plants that made automobiles, machinery, furniture and other wood products, or manufactured metal products such as cans, tinware, and handtools. Although production painters are scattered geographically, large numbers are employed in industrialized States. A fourth of all furniture painters were employed in North Carolina and Pennsylvania, while one-third of all automobile painters worked in Michigan—over half of these in Detroit. Over a quarter of the painters employed by companies making machinery and metal products worked in Ohio and Illinois.

Training, Other Qualifications, and Advancement

Because no formal apprenticeship or training program exists, new production painters acquire their skills on the job. Inexperienced workers often start off loading and unloading items from conveyor lines. After they become familiar with the production process and as openings arise, they may be taught new painting skills. They usually learn the work by watching and helping experienced painters. Training varies from a few days to several months. Some modern painting processes, such as those used to apply powdered coatings, demand more skill than others and thus a correspondingly longer training period. As painters gain experience they can advance to higher skill categories, assume more responsibility, and receive higher wages.

Production painters usually have to stand for long periods of time to do their job. Although they seldom have to lift heavy objects, the production line nature of the job demands good physical condition, since the painters may be exposed to fumes or have to bend or stoop in their work. For example, to paint the underside or top of an object, such as a car, may require reaching or crouching. Good eyesight is an asset to distinguish colors and check that paint has been applied evenly. High school graduation is generally not required for entry level positions, but a diploma or its equivalent may be needed to advance to higher skill levels.

Opportunities for advancement are limited, although a small number of production painters become supervisors.

Employment Outlook

Employment of production painters is expected to increase at about the same rate as the average for all occupations through the mid-1980's. Many job openings also will result as experienced workers retire, die, or transfer to other occupations.

Most manufacturing industries are expected to increase their output in the years ahead. Demand for consumer products, such as automobiles and furniture, will increase as population and personal income grow. Business growth will create a need for more industrial machinery and equipment. Employment of painters, however, is not expected to keep pace with manufacturing output because increased use of automatic painting processes and other labor-saving innovations should raise output per worker.

Most production painters work in plants that produce durable goods, such as automobiles, where employment is particularly sensitive to changes in general economic and business conditions. Therefore, these painters may be subject to occasional layoffs.

Earnings and Working Conditions

Hourly wage rates for production painters ranged from $2.63 to $6.12 in 1976, based on information from a limited number of union contracts. Most painters covered by these contracts earned between $4 and $5 per hour.

Because painters are exposed to fumes from paint and paint-mixing ingredients, they may wear masks which cover the nose and mouth. Many wear coveralls to protect their clothes. They also may need earplugs, since noisy factory conditions often exist. When painting large objects, such as a car or refrigerator, they may have to work in awkward and cramped positions.

Among unions organizing production painters are the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; International Association of Machinists and Aerospace Workers; and the United Steelworkers of America

Sources of Additional Information

More facts about job opportunities in this field may be available from local offices of the State employment service. General information on pro-

duction painters may be obtained from:

Materials Marketing Associates, Inc., Shepard-Benning Building, 520 Pleasant, St. Joseph, Mich. 49085.

Federation of Societies for Coatings Technology, 1315 Walnut St. Philadelphia, Pa. 19107.

STATIONARY ENGINEERS

(D.O.T. 950.782)

Nature of the Work

Stationary engineers operate and maintain the machinery that provides power for industry; heat and air-conditioning for factories, hospitals, and other buildings; and light for every city and town. Among the equipment they tend and control are steam boilers, diesel engines, turbines, generators, pumps, condensers, and air compressors.

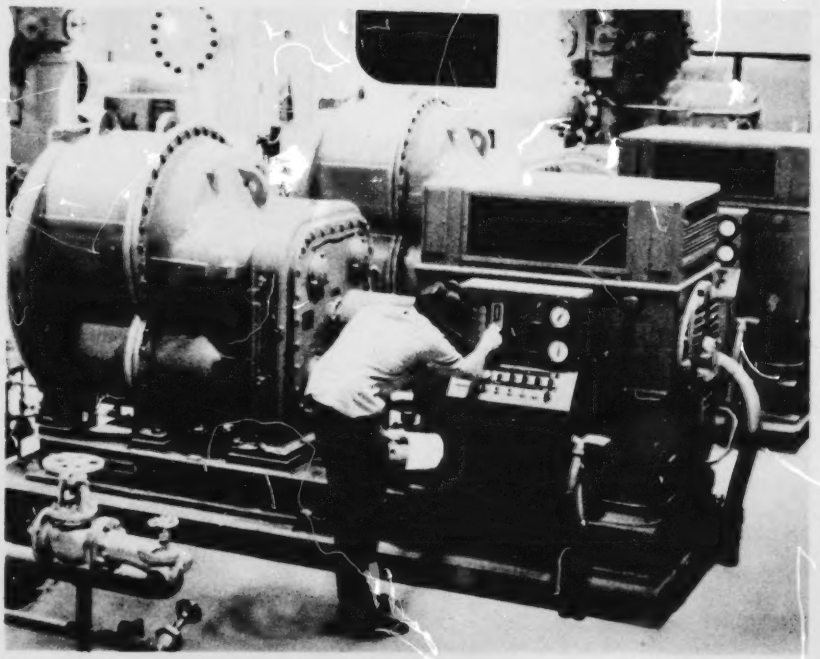
Stationary engineers monitor the various meters and gauges that are attached to equipment to make sure they are running properly, and make adjustments whenever necessary. On a steam boiler, for example, they check the meters and gauges that indicate steam pressure and the amount of fuel being consumed.

Stationary engineers, or power engineers as they often are called, check the equipment regularly to make sure that adequate power is provided without wasting fuel. They can control both the flow of fuel to the boiler and the steam pressure by adjusting throttles or valves. Other types of equipment may be regulated using switches or levers.

Stationary engineers also protect equipment from soot and corrosion. Boiler water, for example, frequently is tested for purity and treated with chemicals.

These workers detect and identify any trouble that develops. They watch and listen to machinery and routinely check the safety controls. Often stationary engineers make minor repairs, such as replacing defective valves, gaskets, or bearings.

In a large plant, the stationary engineer may be in charge of the boiler room, and direct the work of assistant stationary engineers, turbine operators, boiler tenders, and air-conditioning and refrigeration mechanics. In a small plant, the stationary engineer may be the only person operating and maintaining equipment.



Stationary engineers operate generators and turbines.

Places of Employment

In 1976, 194,000 stationary engineers were employed in a wide variety of places, including power stations, factories, sewage and water-treatment plants, office and apartment buildings, hotels, and hospitals. Federal, State, and local governments also employed large numbers of these workers. Usually, plants that operate on three shifts employ four to eight stationary engineers, but some have more. In many plants, only one engineer works on each shift.

Because stationary engineers work in so many different kinds of industries, they are employed in all parts of the country. Although some are employed in small towns and in rural areas, most work in the more heavily populated areas where large industrial and commercial businesses are located.

Training, Other Qualifications, and Advancment

Many stationary engineers start as helpers or oilers and acquire their skills through informal on-the-job experience. A good background also can be obtained in the Navy or Merchant Marine. However, most training authorities recommend formal apprenticeship programs because of the increasing complexity of the machines and systems.

In selecting apprentices, most joint labor-management apprenticeship committees prefer high school or trade school graduates who have received instruction in mathematics, mechanical drawing, machine-shop practice, physics, and chemistry. Mechanical aptitude, manual dexterity, and good physical condition also are important qualifications.

The apprenticeship usually lasts 4 years. In addition to on-the-job training, apprentices receive classroom instruction in practical chemistry, elementary physics, blueprint reading, applied electricity, and other technical subjects.

Becoming a stationary engineer without going through a formal apprenticeship program usually takes

many years of experience as an assistant to licensed stationary engineers or as a boiler tender. This practical experience can be supplemented by technical or other school training or home study.

Many States, the District of Columbia, and many large and medium-sized cities have licensing requirements for stationary engineers. Although requirements for a license differ from place to place, applicants usually must be at least 18 years of age, reside for a specified period in the State or locality in which the examination is given, meet the experience requirements for the class of license requested, and pass a written examination.

Generally, there are several classes of stationary engineer licenses. Each class specifies the steam pressure or horsepower of the equipment the engineer can operate. The chief engineer license permits the stationary engineer to operate equipment of all types and capacities. An applicant for this license may be required to have a high school education and an approved apprenticeship or on-the-job training. The lower class licenses limit the capacity of the equipment the engineer may operate without the supervision of a higher rated engineer.

Because of regional differences in licensing requirements, a stationary engineer who moves from one State or city to another may have to pass an examination for a new license. However, the National Institute for Uniform Licensing of Power Engineers is now assisting many States in adopting a standardized licensing program that would eliminate this problem by establishing reciprocity of licenses.

Stationary engineers advance to more responsible jobs by being placed in charge of larger, more powerful, or more varied equipment. Generally, engineers advance to these jobs as they obtain higher class licenses. Advancement, however, is not automatic. For example, an engineer who has a first-class license may work for some time as an assistant to another first-class engineer before a vacancy occurs. Some stationary engineers eventually advance to jobs as plant engineers and as building and plant superintendents. A few obtain jobs as examining engineers and technical instructors.

Employment Outlook

Employment of stationary engineers is expected to show little change through the mid-1980's. Nevertheless, several thousand job openings will arise annually because of the need to replace experienced workers who retire, die, or transfer to other occupations.

Industrial growth will result in an increased use of large boilers and auxiliary equipment in factories, powerplants, and other buildings. The need for additional stationary engineers, however, will be limited by the trend toward more powerful and more centralized equipment. For example, a large boiler operated by one stationary engineer can supply heat and refrigeration for several buildings, instead of each building having its own small boiler and its own engineer.

Earnings and Working Conditions

Stationary engineers had average hourly earnings of $7.03 in 1976, according to a survey of 21 metropolitan areas. This was almost 50 percent higher than the average for all nonsupervisory workers in private industry, except farming. Averages for engineers in individual cities ranged from $4.69 in Greenville, S.C. to $7.99 in the San Francisco area.

Stationary engineers generally have steady year-round employment. They usually work a 5-day, 40-hour week. In plants that operate around the clock, they may be assigned to any one of three shifts—often on a rotating basis—and to Sunday and holiday work.

Engine rooms, powerplants, or boiler rooms usually are clean and well-lighted. Even under the most favorable conditions, however, some stationary engineers are exposed to high temperatures, dust, and dirt from the equipment. General maintenance duties may cause contact with oil and grease, and fumes or smoke. Workers also may have to crawl inside boilers and work in crouching or kneeling positions to inspect, clean, or repair the interiors.

Because stationary engineers often work around boilers and electrical and mechanical equipment, they must be alert to avoid burns, electric shock, and injury from moving machinery.

Among the unions to which these workers belong are the International Union of Operating Engineers and the International Brotherhood of Firemen and Oilers.

Sources of Additional Information

Information about training or work opportunities is available from local offices of State employment services, locals of the International Union of Operating Engineers, and from State and local licensing agencies.

Specific questions about the occupation may be referred to:

International Union of Operating Engineers, 1125 17th St. NW., Washington, D.C. 20036.

National Association of Power Engineers, Inc. 176 West Adams St., Chicago, Ill. 60603.

For questions concerning licensing requirements, contact:

National Institute for Uniform Licensing of Power Engineers, 176 West Adams St., Chicago, Ill. 60603.

WASTEWATER TREATMENT PLANT OPERATORS (Sewage-Plant Operators)

(D.O.T. 955.782)

Nature of the Work

Clean water is essential for our health and recreation and for the existence of fish and wildlife. Wastewater treatment plant operators help keep America's water clean by removing harmful domestic and industrial waste.

Waste materials are carried by water through sewer pipes to treatment plants. Operators control equipment to remove these materials or render them harmless. By operating and

maintaining pumps, pipes, and valves that connect the collection system to the treatment facility, operators move the wastewater through the various treatment processes.

Operators read and interpret meters and gauges to make sure plant equipment is working properly. Other jobs include operating chemical feeding devices to remove pollutants from wastewater; taking samples of the water for laboratory analysis; and testing and adjusting the level of chlorine in the water. Operators also make minor repairs on valves, pumps, and other equipment. They use gauges, wrenches, pliers, and other common handtools, as well as special tools. Occasionally operators must work under emergency conditions—for example, a heavy rainstorm may cause abnormal amounts of wastewater to flow into sewer pipes and threaten to exceed a plant's treatment capacity.

The duties of operators vary depending on the type and size of plant. For example, the treatment process in an industrial plant, such as a food-processing company, may be simple since the wastewater is of a known content. Treatment plants that serve entire cities, on the other hand, must be equipped to treat a mixture of waste products that varies daily, thus making the operator's job more complicated. In smaller plants, one operator may be responsible for the entire system—making repairs, keeping plant records, handling complaints, and doing the maintenance work for the facility. In larger plants, the staff may include chemists, laboratory technicians, mechanics, helpers, supervisors, and a superintendent.

As a result of the passage of the Federal Water Pollution Control Act of 1972, water pollution standards will become increasingly stringent in the future. In order to meet these higher requirements, operators will have to be able to operate more sophisticated systems.

Places of Employment

About 100,000 people worked full time as wastewater treatment plant operators in 1976, of whom about 58,000 worked in municipal plants, 40,000 in private industry, and 2,000 in Federal installations.

Wastewater treatment plant operators are employed throughout the country. Geographically, employment is distributed much like the Nation's population, with most jobs in larger towns and cities. Many operators in small towns are employed part time.

Training, Other Qualifications, and Advancement

Trainees usually start as helpers and learn their skills on the job under the direction of an experienced operator. They learn by doing routine tasks such as recording meter readings; taking samples of wastewater and sludge; and doing simple maintenance and repair work on pumps, electric motors, and valves. They also are expected to perform housekeeping tasks such as cleaning and maintaining plant equipment and property.

Persons interested in entering the field should have some mechanical aptitude and should be competent in basic mathematics. Employers generally prefer trainees who have a high school diploma or its equivalent, and in some States this is a minimum educational requirement. Some positions, particularly in larger cities and towns, are covered by civil service regulations, and applicants may be required to pass written examinations testing elementary mathematics skills, mechanical aptitude, and general intelligence. Operators must be agile, since they have to climb ladders and move easily around heavy machinery.

Some 2-year programs leading to an associate degree in wastewater technology are available; these provide a good general knowledge of the water pollution control field as well as basic preparation for becoming an operator. Since plants are becoming more complex, completion of such courses increases an applicant's chances for employment and promotion.

Most State water pollution control agencies offer training courses to improve the skills of treatment plant operators. These courses cover principles of sludge digestion, odors and their control, chlorination, sedimentation, biological oxidation, and flow measurements. Some operators take correspondence courses on subjects related to wastewater treatment, and some employers will pay part of the tuition for courses leading to a college degree in science or engineering.

Operators may be promoted to positions such as supervisor and superintendent. A high school diploma and increasingly responsible operator experience may be sufficient to qualify as superintendent of a small plant, since at many small plants the superintendent also serves as an operator. Educational requirements, however, are rising as larger, more complex treatment plants are being built to meet new water pollution control standards. Superintendents of large plants are expected to have an engineering or science degree. Training in management techniques is becoming increasingly important for operators seeking positions with supervisory responsibilities. A limited number of operators may become technicians employed by State water pollution control agencies to monitor and provide technical assistance to plants throughout the State. Some technical-vocational school or junior college training generally is preferred for technician jobs.

In 40 States, supervisors and certain operators must pass an examination to certify that they are capable of overseeing treatment plant operations. Voluntary certification programs are in effect in the remaining States, with the exception of Alaska.

Under a typical program, there are different classes of certification for different sizes of treatment plants. For example, to be certified a "class I operator" capable of operating a small plant with simple equipment, an applicant should be a high school graduate, demonstrate general knowledge of treatment operations by passing a written test, and complete 1 year of satisfactory employment at a treatment plant. Requirements for certification as a class IV operator who supervises a large plant employing complex technology may require a bachelor's degree in sci-

ence or engineering; 4 years of treatment plant experience, 2 years of which were in a position of major responsibility; and specific knowledge of the entire field of wastewater treatment as demonstrated through a written test. Typically, a large plant would employ mostly operators certified for operating small or medium-sized plants, but always under the supervision of a class IV operator.

Employment Outlook

Employment of wastewater treatment plant operators is expected to increase much faster than the average for all occupations through the mid-1980's, mainly as a result of the construction of new treatment plants to process the increasing amount of domestic and industrial wastewater. Also, more highly trained operators will be needed as existing plants expand and modernize their facilities to cope more effectively with water pollution. In addition to new jobs from employment growth, many job openings will occur as experienced operators retire, die, or transfer to other occupations.

People who enter this field should have fairly steady employment in the years ahead. Even during economic downturns, treatment plants seldom lay off employees.

Earnings and Working Conditions

Operators employed at small and medium-sized wastewater treatment plants generally earned between $9,000 and $13,000 a year in 1976. Some experienced operators earned more than $20,000 a year in large plants. Superintendents of small plants earned about the same as operators, but superintendents of medium-sized plants generally earned between $13,000 and $20,000 and as much as $25,000 or more in large plants. Salaries for trainees were roughly 80 percent of operators' salaries in most cities.

Because pollution control is a never-ending task, operators work different shifts and in an emergency may have to work overtime. Operators may be exposed to unpleasant odors, as well as noise from the operation of electrical motors and pumps. However, odor is kept to a minimum by the use of chlorine or other chemicals.

Sources of Additional Information

People interested in a career in wastewater treatment should contact their local or State water pollution control agencies. Additional information is available from:

Water Pollution Control Federation, 2626 Pennsylvania Ave., NW., Washington, D.C. 20037.

Manpower Planning and Training Branch (WH-596), Office of Water Programs, Environmental Protection Agency, Washington, D.C. 20460.

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What to Look For in this Reprint

To make the *Occupational Outlook Handbook* easier to use, each occupation or industry follows the same outline. Separate sections describe basic elements, such as work on the job, education and training needed, and salaries or wages. Some sections will be more useful if you know how to interpret the information as explained below.

The TRAINING, OTHER QUALIFICATIONS, AND ADVANCEMENT section indicates the preferred way to enter each occupation and alternative ways to obtain training. Read this section carefully because early planning makes many fields easier to enter. Also, the level at which you enter and the speed with which you advance often depend on your training. If you are a student, you may want to consider taking those courses thought useful for the occupations which interest you.

Besides training, you may need a State license or certificate. The training section indicates which occupations generally require these. Check requirements in the State where you plan to work because State regulations vary.

Whether an occupation suits your personality is another important area to explore. For some, you may have to make responsible decisions in a highly competitive atmosphere. For others, you may do only routine tasks under close supervision. To work successfully in a particular job, you may have to do one or more of the following:

- motivate others
- direct and supervise others
- work with all types of people
- work with things—you need good coordination and manual dexterity
- work independently—you need initiative and self-discipline
- work as part of a team
- work with details, perhaps numbers or laboratory reports
- help people
- use creative talents and ideas
- work in a confined area
- do physically hard or dangerous work
- work outside in all types of weather

A counselor can help you find out more about your interests and abilities so you can judge whether a job's characteristics suit you.

The EMPLOYMENT OUTLOOK section tells whether or not the job market is likely to be favorable. Usually an occupation's expected growth is compared to the average projected growth rate for all occupations (20.1 percent between 1976 and 1985). The following phrases are used:

Much faster	50% or more
Faster	25.0 to 49.9%
About as fast	15.0 to 24.9%
Slower	4.0 to 14.9%
Little change	3.9 to -3.9%
Decline	-4.0% or more

Generally, job opportunities are favorable if employment is growing at least as fast as for the economy as a whole.

But, you would have to know the number of people competing with you to be sure of your prospects. Unfortunately, this supply information is lacking for most occupations.

There are exceptions, however, especially among professional occupations. Nearly everyone who earns a medical degree, for example, becomes a practicing physician. When the number of people pursuing relevant types of education and training and then entering the field can be compared with the demand, the outlook section indicates the supply/demand relationship as follows:

Excellent	Demand much greater than supply
Very good	Demand greater than supply
Good or favorable	Rough balance between demand and supply
May face competition	Likelihood of more supply than demand
Keen competition	Supply greater than demand

Competition or few job openings should not stop your pursuing a career that matches your aptitudes and interests. Even small or overcrowded occupations provide some jobs. So do those in which employment is growing very slowly or declining.

Growth in an occupation is not the only source of job openings because the number of openings from turnover can be substantial in large occupations. In fact, replacement needs are expected to create 70 percent of all openings between 1976 and 1985.

Finally, job prospects in your area may differ from those in the Nation as a whole. Your State employment service can furnish local information.

The EARNINGS section tells what workers were earning in 1976.

Which jobs pay the most is a hard question to answer because good information is available for only one type of earnings—wages and salaries—and not even this for all occupations. Although 9 out of 10 workers receive this form of income, many earn extra money by working overtime, night shifts, or irregular schedules. In some occupations, workers also receive tips or commissions based on sales or service. Some factory workers are paid a piece rate—an extra payment for each item they make.

The remaining 10 percent of all workers—the self-employed—includes people in many occupations—physicians, barbers, writers, and farmers, for example. Earnings for self-employed workers even in the same occupation differ widely because much depends on whether one is just starting out or has an established business.

Most wage and salary workers receive fringe benefits, such as paid vacations, holidays, and sick leave.

Workers also receive income in goods and services (payment in kind). Sales workers in department stores, for example, often receive discounts on merchandise.

Despite difficulties in determining exactly what people earn on the job, the Earnings section does compare occupational earnings by indicating whether a certain job pays more or less than the average for all nonsupervisors in private industry, excluding farming.

Each occupation has many pay levels. Beginners almost always earn less than workers who have been on the job for some time. Earnings also vary by geographic location but cities that offer the highest earnings often are those where living costs are most expensive.

What's an ad for the OOQ doing in a place like this?

The career information contained in the reprint you are reading was taken from the 1978–79 edition of the Occupational Outlook Handbook. But the Handbook is not the only source of useful career information published by the Bureau of Labor Statistics. The Handbook's companion, the Occupational Outlook Quarterly, is published four times during the school year to keep subscribers up to date on new occupational studies completed between editions of the Handbook. The Quarterly also gives practical information on training and educational opportunities, salary trends, and new and emerging jobs—just what people need to know to plan careers.

If you were a subscriber to recent issues of the Occupational Outlook Quarterly, you could have learned

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